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the deep fiords and as having strongly modified the coastal lowlands. The large importance recently given by Sederholm to faults in the production of fiords is denied.

Ahlmann's essay is well illustrated by half-tone views, maps, and sketches; and an elaborate bibliography is given at its close. As is usual in analytical essays, geographical description here occupies less space than argumentative demonstration, and the past thus comes to hold a larger share of the reader's attention than the present. This relation is likely to prevail in such studies until the results of analysis are so well assured as to be generally accepted. For example, twenty years ago the origin of hanging lateral valleys was in discussion; now their origin is settled, and they are referred to as well-understood elements of certain landscapes. Progress in this respect is rapid. We may expect that our successors thirty or fifty years from now will use the results of our argumentative analyses in their everyday descriptions. In the meantime, the results gained at present would be more generally appreciated and used by economic geographers, historians, and others, if they could be gathered in a continuous descriptive statement which would satisfy most readers, but from which any reader might turn to the analysis if he wished to learn the evidence upon which the account of any item is based.

Regarding Ahlmann's explanation of the coastal lowlands, it may be noted that wave work should expectedly have had some share in carving the margin of the highlands; for the upheaval of the pre-existent lower lands appears to have been of a warping nature, probably accompanied by depression along the ocean border; and upon the shore line thus initiated the waves of the Atlantic must have accomplished a good amount of abrasion while the rivers were maturing their valleys in the interior and widening them to the confluent lowland of today near the coast. The two processes should therefore not be regarded as mutually exclusive, although the shares that they may have had in wearing down the uplifted land mass may have varied from place to place. Around the present coast of southern Norway wave work may have been weak during the cycle of erosion in which the mature valleys were excavated, for at that time a large part of the North Sea may have been dry land; hence the lowland there may be largely ascribed to valley widening. But along the mid-western coast, where the ocean waves came in unobstructed from deep water, a certain share of the lowland may be plausibly regarded as of marine origin, particularly in districts where the present ascent from the lowland to the highlands is abrupt. This possibility is given less consideration than it appears to deserve.

It is gratifying to read Ahlmann's statement in his preface: "During my journeys, and also in the treatment of the observations made in their course, I have followed the general principles of geomorphology which have been worked out in America. . . . . Indeed I consider that, without the conception of 'cycle,' it is scarcely possible to bring any order into, or obtain any unity in, the complex of heterogeneous topographical elements that compose the Norwegian land of the present day." W. M. DAVIS

THE MOORS OF FINLAND

A. K. CAJANDER. **Studien über die Moore Finnlands.** Maps, diagrs., ills. *Fennia,* Vol. 35, No. 5, pp. 1-208. Helsingfors, 1913-15.

This report on the moors of Finland is supplied with two maps in color on the scale of 1:20,000 and a map of the route traveled in the botanical and ecological exploration of this country of forest, lakes, and moors, with rivers emptying into the Gulf of Bothnia, the Gulf of Finland, and the White Sea. The author, one of the foremost Finnish botanists, has had abundant experience in making similar surveys in Siberia and elsewhere in Europe. The work consists of an introduction, which gives the author's general point of view, a general part (pp. 5-85), and a special part (pp. 89-208).

Moors are defined differently according to the viewpoints of those who make a study of them. If defined from the geological viewpoint, they are natural places where peat is found. The biological, or rather ecological, definition is that a moor is a plant formation consisting of peat-forming plants. Dr. Cajander all through his report lays especial emphasis on the ecological phases of moors, and several pages are devoted to an introductory discussion of the various types of moors, which have been described and named by ecologists who have made telmatology their special line of investigation. The current views on high moors (*Hochmoore*), low moors (*Flachmoore* and *Niedermoore*), transitional moors (*Zwischenmoore*) are analyzed in several pages of footnotes. After sifting the evidence, the author concludes that in Finland there are four moor types, as follows:

(1) Gray moors: treeless, normally more or less wet and overflowed, without moss ricks (rounded elevated parts of the moor), poor in shrubs (except *Oxycoccus* and

Andromeda); the moss vegetation, as far as present, consisting of peat mosses (*Sphagnum*). In calcium-poor regions.

(2) Brown moors: treeless, normally more or less wet and overflowed, without moss ricks, moderately poor in large shrubs; the moss vegetation, as far as present, consisting principally of so-called brown mosses (various *Amblystegia, Hypnum trichoides, Paludella, Meesea, Cinclidium*, etc.). In calcium-rich regions.

(3) Shrub moors: little, or scarcely, overflowed moors with or without ricks, with more or less abundant vegetation of moderately tall shrubs; the moss vegetation being formed principally of Sphagneae and the forest growth, nearly always present, consisting principally of more or less twisted and dwarfed pines (*Pinus silvestris*). In calcium-poor and calcium-rich regions. The ground water more or less stagnant, or very slow-flowing.

(4) Tree moors: forest moors, the woody growth consisting of spruces (*Picea excelsa*) and broad-leaved trees, the pine unimportant; the moss vegetation consisting normally of peat moss and bear moss (*Polytrichum commune*) or with true mosses in increasing numbers. The ground water more or less distinctly flowing. In calcium-poor and calcium-rich regions.

The origin of the Finnish moors is to be attributed to the filling of shallow lakes and lake basins with encroaching plants and to the invasion of moor-forming plants into flooded lands or into forests. The principal moor-forming plants of the first category are *Equisetum fluviatile, Carex rostrata, Heleocharis palustris, Hippuris vulgaris, Alisma-plantago-aquatica, Sparganium simplex, Lysimachia thyrsiflora, Menyanthes trifoliata*, and a number of hydrophytes, as *Lemna minor, Utricularia vulgaris*, and other water plants of the genera *Potamogeton, Nymphaea*, and *Nuphar*. Much less frequently, and principally only in southern Finland, appear *Sparganium ramosum*, two species of *Typha. Glyceria aquatica, Scolochloa arundinacea*, and *Carex stricta*. The remains of all these plants with the mud-covered earth contribute to the formation of the layers of peat. The other method of moor formation by the flooding of river valleys with water is described at some length by Cajander with the aid of maps in the text.

In the development of the moors a variation in the amount of moisture is very frequent. This is observable in the growth of a moor from a shallow lake and in the invasion of a forest by bog mosses and typical moor plants. *Sphagnum fuscum* is one of the principal bog mosses active in raising the ground-water level in the formation of moss ricks. The growth of the Scotch pine on the gray moors, shrubs moors, and cotton-grass moors has been studied and plotted by the author in relation to the development of these kinds of moors. The moor complex is then described in great detail, with the aid of outline and colored maps, for the high moors of different geographical types.

The special part of the monograph deals with the types of moors in Finland; and each section, under the headings Gray Moors, Brown Moors, Shrub Moors, and Tree Moors, is introduced with a definition of each type printed in italics. The principal and characteristic plant species are given in detail for each type of moor. Some of the floristic details are listed under the heads of grasses, herbs, shrubs, and trees. The pages fairly bristle with the enumeration of the principal plants which enter into the different moor associations. Each of the twenty plates has two exceptionally clear photographic reproductions of the different kinds of Finnish moors.

The whole monograph is an exceptionally good piece of synecological investigation, and the author has succeeded in throwing considerable additional light upon a much confused subject. It would seem almost necessary to call a convention of ecologists and botanists in order to discuss the nomenclature of moors and bogs with the hope of bringing order out of chaos. Cajander has done a service in discussing the origin, nature, and constituent plants of the Finnish moors without emphasizing the distinction between high moors and low moors and in using other distinctive terms.

JOHN W. HARSHBERGER

THE FORMATION OF CORAL REEFS

T. W. VAUGHAN. **Corals and the Formation of Coral Reefs.** Maps, diagrs., ills. *Ann. Rept. Smithsonian Instn. for 1917*, pp. 189-276. Washington, D. C., 1919.

The first part of this paper presents an excellent summary of the anatomy of the coral organisms and of the ecological conditions under which they live. The results of many experiments by Vaughan, Mayor, and others on the conditions affecting coral growth are cited. Among these may be mentioned the relation to temperature, to light, to the salt content of the ocean, the capacity of corals to withstand exposure to the air, the method by which they catch their food and the nature of their food sup-